

A New Approach in Multiple Attribute Decision Making using R -norm entropy and Hamming Distance Measure

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Abstract

The theory of intuitionistic fuzzy (IF) set is well suitable to deal with the vagueness and hesitancy. In the present communication, we have considered R -norm entropy with both uncertainty and hesitancy degree of an IF set. Using this R -norm entropy, we have solved a multiple attribute decision making (MADM) problem in which attribute values are expressed with IF values. In MADM problem, we mainly encounter with two types of problems. First is when we don't have any information regarding attribute weights and second is when we have little information about weights, i.e., they are partially known to us. In this paper, we have considered both the cases with examples. For the first case, we have used an extension of entropy weight method to calculate the attribute weights and in second case attribute weights are calculated by using the minimum entropy principle method which is based on solving a linear programming model. The two methods are effectively explained by taking real life examples. Also the two examples are calculated by using the TOPSIS method suggested by Chen and Tsao and shown that the outputs of both the methods coincide.

Keywords: Intuitionistic fuzzy entropy, R -norm intuitionistic fuzzy entropy, MADM, TOPSIS, weighted Hamming distance.

1. Introduction

For multi-attribute decision problems, it is necessary to consider many factors simultaneously. These factors complicates the problem and it becomes difficult to arrive at a conclusion. We often notice that crisp data is inadequate or insufficient to handle vagueness or fuzziness of realistic decision problem that can not be represented by the crisp numbers. In such cases, fuzzy sets or extended fuzzy sets are proved to be better choice in modelling the human judgement. Intuitionistic fuzzy (IF) set firstly proposed by Atanassov [1] is an extension of Zadeh's fuzzy set [38]. The concept of IF set is based on the simultaneous consideration of membership μ and non-membership ν of an element of a set in the set itself. It is postulated that $0 \leq \mu + \nu < 1$. A similar approach, the so called vague sets was suggested by Gau and Buehrer in [15] is proved to be equivalent to IF set proposed by Atanassov [2]. IF set seems more suitable to express the human's